

ANNOTATED OUTLINE

Costs and Benefits of a Biomass-to-Ethanol Production Industry in California

9/19/2000

I. EXECUTIVE SUMMARY

An executive summary section will provide an overview of the study results and findings in condensed form.

II. INTRODUCTION

The introductory section will explain the origins and purpose of this \$250,000 study, as directed by the Fiscal Year 2000-2001 California State Budget, which includes a specific item appropriating funding for the study inserted at the request of Assembly Member Strom-Martin. The study follows up on one of the recommendations of the Energy Commission's previous study report entitled Evaluation of Biomass-to-Ethanol Fuel Potential in California (December 1999), which was prepared in response to Governor Gray Davis Executive Order D-5-99. The rationale for a more definitive examination of the costs and benefits to the state of developing an industry to produce ethanol from biomass sources will be briefly reiterated.

III. BACKGROUND

This section will further establish the basis for the study's cost and benefit focus, in the context of California's overall investigation of biomass-derived ethanol as a transportation fuel. The history of ethanol production and application as a motor fuel will be briefly recounted, emphasizing the most recent events affecting potential expanded use of ethanol in California as a replacement for the gasoline additive MTBE and as a neat fuel for a growing population of flexible fuel vehicles.

Findings of the previous Commission study (cited above) will be briefly summarized, highlighting the areas most relevant to this follow-on study of costs and benefits. The specific recommendations of the study that led to undertaking this follow-on study will be restated, with further explanation of why this evaluation of costs and benefits to the state is an important step in determining the most appropriate course of state action to foster a biomass-to-ethanol industry.

Other areas of related ongoing activity involving ethanol in California and elsewhere will be briefly noted to help place this study in the larger perspective of ethanol energy development worldwide.

IV. APPROACH AND METHODOLOGY

This section will set forth the approach and methodology for the analysis of costs and benefits of a biomass-to-ethanol production industry in California. Guidelines will be

established for determining whether a prospective cost or benefit area is appropriate to include in the study, and whether each selected cost or benefit area is subject to quantitative estimation or will only be qualitatively evaluated. Various methodologies for quantitative estimation of costs and benefits will be considered and the method selected for this study elaborated on.

This section will also explain certain basecase assumptions employed in the study regarding development of a biomass-based ethanol production industry in California, including number of facilities, sizes and production capacities, development timetable, production technology and feedstocks, and collocation with biomass power plants.

V. COSTS OF AN IN-STATE BIOMASS TO ETHANOL PRODUCTION INDUSTRY

This section will develop quantitative estimates and/or qualitative evaluations of the costs associated with developing a biomass-to-ethanol production industry in California matching the characteristics of the base case. Both direct and indirect costs will be estimated¹. Qualitative descriptions will describe why a cost category cannot be quantitatively estimated when applicable.

This section will attempt, at a minimum, to cover the cost categories listed in Attachment A. In addition, consideration of other possible cost categories will be undertaken. An explanation will provide an understanding of why these costs are considered in the cost-benefit analysis.

VI. BENEFITS OF AN IN-STATE BIOMASS TO ETHANOL PRODUCTION INDUSTRY

This section will develop quantitative estimates and/or qualitative evaluations of the benefits of producing ethanol from biomass within California. Both direct and indirect benefits will be estimated². A description will follow of why a benefit category cannot be quantitatively estimated.

¹ A direct cost is a cost paid by an entity engaging in production and supply of ethanol.

Indirect costs reflect costs not paid by those producing and purchasing in the biomass-to-ethanol production industry.

² Direct benefits are those increases in output or productivity associated with the development of a biomass-based ethanol production industry in California.

Indirect benefits consist of benefits going to those who do not participate in the biomass-to-ethanol production industry.

This section will attempt, at a minimum, to cover the benefit categories listed in Attachment B. In addition, consideration of other possible benefit categories will be undertaken. An explanation will provide an understanding of why these benefits are considered in the cost-benefit analysis.

VII. SENSITIVITY ANALYSIS

This section will examine the implications of possible variations from the base case assumptions regarding development of a biomass-to-ethanol industry in California. At a minimum, these sensitivities will include:

1. Larger or smaller size of industry and production capacity
2. Longer or shorter development timetable
3. Use of different processing technologies and feedstocks
4. Stand-alone (rather than collocated) facilities

VIII. ETHANOL FUEL MARKET IMPACTS

This section will explore implications of the above cost/benefit analysis for ethanol fuel markets in California. This will include responses to the questions posed in the budget language regarding impacts on consumer fuel costs from in-state ethanol production and from ethanol imports. Other economic aspects of matching a biomass-to-ethanol production industry with California markets for ethanol, both as a gasoline blending component and as a neat motor fuel will also be examined.

A. This section will address the implications of a biomass-to-ethanol industry in California for consumer fuel costs in state fuel markets.

B. This section will address the implications of imported ethanol for consumer fuel costs in state fuel markets.

C. This section will examine issues associated with expanded ethanol fuel market development in California for both gasoline blending and neat fuel applications, including costs and technical considerations associated with ethanol distribution infrastructure, considering ethanol supply from in-state sources and imports.

IX. OTHER STUDY AREAS

Besides the primary emphasis of the study on costs and benefits and other economic aspects of ethanol production and application, several other relevant aspects of biomass-to-ethanol development in California will be reviewed in this section. Examples include:

A. Status of Biomass Power Plants as Candidates for Ethanol Facility Collocation

California's network of biomass electric generating facilities will be examined to better determine their operating status and outlook, potential for reactivation (in the case of inactive or mothballed plants), and their general suitability as candidate sites for collocated biomass-to-ethanol production facilities.

B. Status of Biomass-to-Ethanol Projects

The status of various biomass-to-ethanol projects being proposed in California and elsewhere in the United States will be updated. Emphasis will be on two California projects receiving most active development attention (Gridley and Collins Pine), summarizing the latest results of feasibility studies already undertaken with state funding support.

C. Implications for Rice Straw Burning

The potential for a biomass-to-ethanol industry to provide an alternative method of disposing of rice straw, and how this option stands to affect California's planned phaseout of rice straw burning will be specifically addressed.

D. Ethanol Incentives in Other States

Incentives applied to foster the production and use of ethanol fuel in other states will be briefly updated and reviewed.

X. CONCLUSIONS AND RECOMMENDATIONS

This section will present the major conclusions drawn from the study's evaluation of costs and benefits and related areas of economic analysis. Recommended future steps for California to consider regarding production and use of renewable transportation fuels such as ethanol will also be set forth.

ATTACHMENT A: COST CATEGORIES

Direct costs

Macroeconomic effects³

Decreased output⁴ (Gross State Product)

Jobs

Decrease employment in industries other than ethanol production

Project Development

Research and development

Engineering design

Plant and equipment

Jobs

Wages in temporary jobs

Unemployment insurance

Social security contribution

New infrastructure

Ethanol plant equipment

Electric generation equipment

Co-product process equipment

Storage

Land

Land purchase

Permitting

Preparation

Financing costs

Obtaining the financing

Interest and other continuing costs

Operating

Jobs

Wages in permanent jobs

Unemployment insurance

Employer's social security contribution

Tax payments

Sales tax

Excise tax

Bank and corporation tax

Income tax

Feedstock

Identifying specific (long-term) sources

Contracting for feedstock supply

³ Macroeconomic effects refer to economy wide outcomes.

⁴ Decreased output may come from the use of inputs in the ethanol production industry that may have a higher use value.

Gathering, processing, and transporting
Possible higher uses of feedstocks
Feedstock supply constraints

Maintenance

Processing

Utilities

Chemicals

Indirect costs

Existing project development assistance

Air quality impacts

Water quality impacts

Soil effects

Noise

Odor

Resource losses from plant siting

Land

Cultural and aesthetic resources

ATTACHMENT B: BENEFIT CATEGORIES

Direct benefits

- Economy-wide effects⁵
 - Increased output⁶ (Gross State Product)
 - Job creation outside the biomass-to-ethanol production industry
- Biomass-to-ethanol production
 - Jobs
 - Temporary employment
 - Income from construction jobs
 - Permanent employment
 - Plant operation
 - Feedstock production
 - Feedstock transportation
 - Taxes
 - Increased revenues from
 - Sales tax
 - Excise tax
 - Bank and corporation tax
 - Income tax
 - Reduce landfill disposal for waste converted into ethanol
 - Paper
 - Green waste
 - Revenue from ethanol sales
 - Sale of energy (electricity) from collocated plants
 - Co-product sales
 - Residual materials markets
 - Forest health
 - Improved timber harvest
 - Decreased forest fire risk
 - Avoided costs for fire protection
 - Reduced loss of assets
 - Timber
 - Structure
 - Equipment
 - Decreased pest damage to timber

⁵ The economic effects may be found from the ethanol production industry or other sectors in the economy.

⁶ Increased output may come from the use of inputs in the ethanol production process are now used more efficiently.

Indirect benefits

- Decreased risk for loss of life
- Improved ecosystem and habitat
- Better scenic views
- Preservation of cultural and historical resources
- Air quality
 - Decreases in global climate change gases
 - Lower emissions of toxic air pollutants
 - Decreased air emissions from producing ethanol
 - CO, NO_x, SO_x, O₃, PM
 - Not burning slash and thinning in logging operations
 - Not burning rice straw and used for ethanol production
- Water quality
 - Not burning slash and thinning in timber and logging operations
 - Reduced erosion or siltation of streams
 - Improved reservoir holdings
 - Additional water for varying uses such as recreation and agriculture irrigation
 - Improved water quality
 - Improved fisheries
- Soil quality
 - Decreased soil contamination
 - Improved agricultural production
- Energy security
- Energy diversity
 - Reduction of energy imports from foreign sources